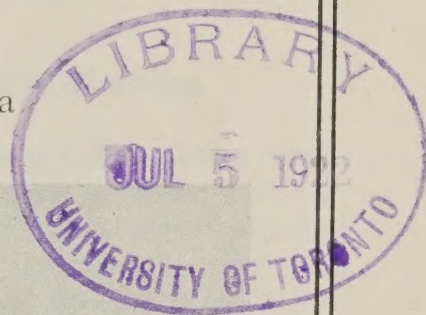


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THE WESTERN WHEAT-STEM SAWFLY AND ITS CONTROL

By NORMAN CRIDDLE
Entomologist in charge for Manitoba



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Field of wheat in Manitoba seriously damaged by Western Wheat-Stem Sawfly.
(Original.)

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THE WESTERN WHEAT-STEM SAWFLY AND ITS CONTROL

By Norman Criddle, Entomological Laboratory, Treesbank, Manitoba.

The Western Wheat-Stem Sawfly (*Cephus cinctus* Nort.) is a native insect which has spread from wild grasses to closely allied cultivated plants such as wheat and rye. It first began to attract general attention early in the present century and from that time it has gradually increased until it is now a pest of great importance. Not only is it causing heavy losses annually but it threatens to make such further inroads into our grain fields that eventually the entire spring wheat growing region may become infested.

DESCRIPTION AND HABITS

The adult sawfly is a four-winged insect not unlike a very narrow-bodied wasp. It is black with yellow markings which form rings on the abdomen. It measures rather more than half an inch in length. These sawflies can be recognized in life by their habit of clinging very closely to the stems of plants and in resting head downwards. They are present, on an average, from June 10 to July 10, and deposit their eggs between those dates.

The eggs are small, elongate, white objects; they are placed within the stem, usually above the topmost joint, by the short horn-like ovipositor which is thrust through the outer covering of the plant by the female sawfly.

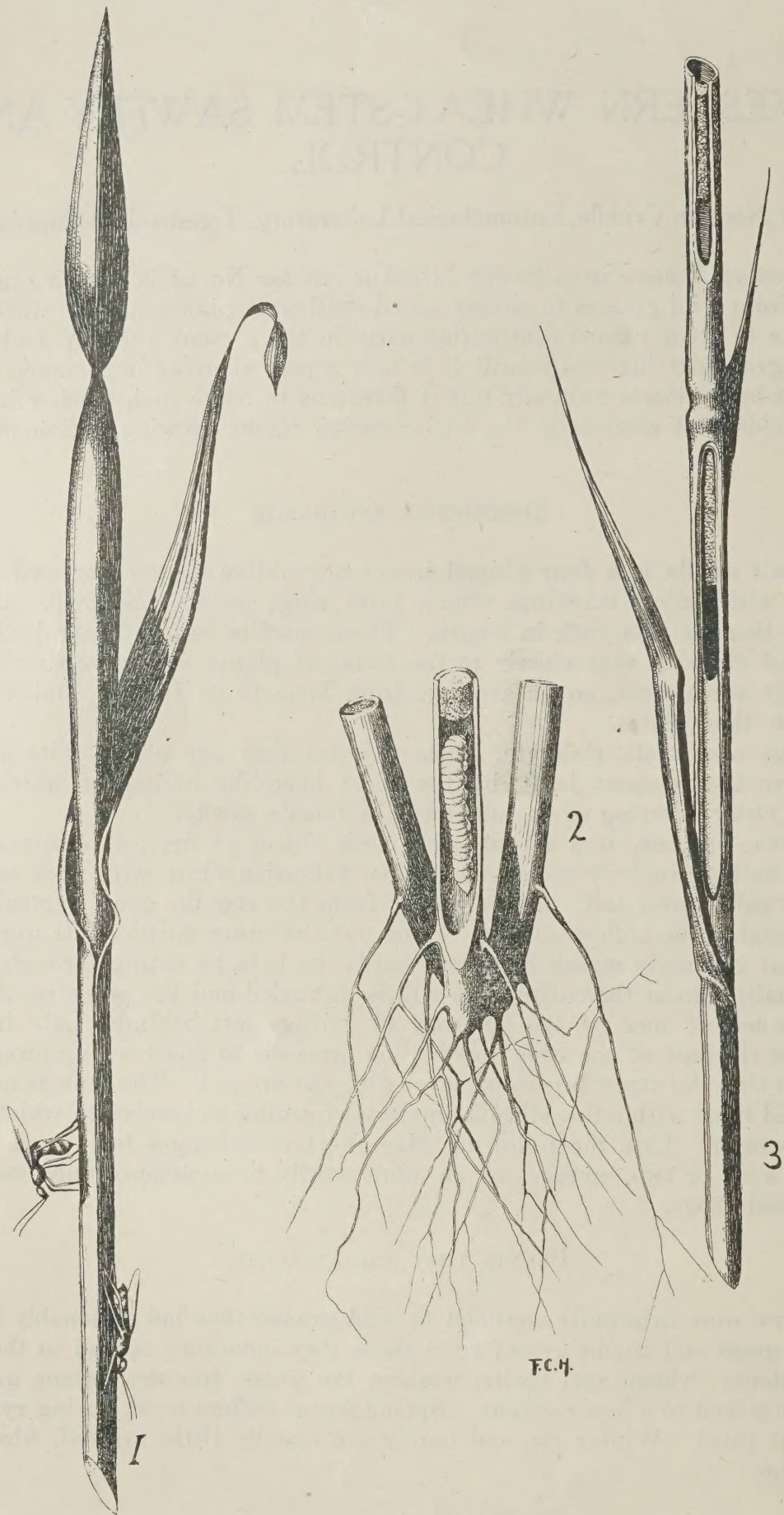
The larva, or grub, is a minute colourless object at first; it eventually attains a length of half an inch or more. It is then yellowish-white with dark mouth parts and a blunt pale brown tail. On emerging from the egg the grub immediately commences to enlarge the hollow stem by eating out the inner portion. It works both up and down but gradually makes its way towards the base by eating through the joints. Thus eventually almost the entire stem will be tunneled and the presence of the insect may be detected at once by the quantity of borings left behind. Late in July the larva reaches the base of the stem and it then proceeds to gnaw a ring around it from the inside so that the straw breaks off level with the ground. The stub is now plugged at the top and lined with a fine silk-like material forming a chamber in which the insect spends the winter. Late the following May the larva changes to a pupa and in the course of a week or two, emerges as an adult sawfly to commence once more the life cycle described above.

PLANTS THAT ARE ATTACKED

The larvæ were originally confined to wild grasses that had reasonably large stems, such as rye grass and thyme grass; from these they have now spread to the following cultivated plants: wheat, rye, speltz, western rye grass, timothy, brome grass, and a few others attacked to a lesser extent. Spring wheat suffers most, spring rye next, and durum wheat third. Winter rye and barley are usually little injured, while oats are quite immune.

CONTROL METHODS

(1) Plough down all infested stubble between August 1 and June 6 of the following year, the ploughing to be not less than five inches deep and turned upside down so that there is little or no overlapping edge. In order to appreciate the necessity of



The Western Wheat-Stem Sawfly, *Cephus cinctus* Nort. 1,—Part of a wheat plant showing a sawfly in the act of egg-laying and lower down another one at rest; 2,—Wheat stubs cut and plugged by the sawfly larvæ, middle stub cut open to show the larva within; 3,—Portion of stem cut open to show tunneling of larva. All natural size. (Original.)

turning the furrow flat, it should be remembered that the sawfly grubs are in the stubs and that they have prepared an opening at the top to enable them to get out later when they have changed to the fly state. To turn this "doorway" so that it will be against the bottom of the furrow will make the emergence of the fly almost impossible, but if this opening at the top of the stub is merely placed on its side a large number of the sawflies will be able to make their way out. As a matter of fact, most of the insects are destroyed when the ploughing is done as recommended, but it is desirable to pack spring ploughing to prevent the adults from forcing their way through it.

(2) Rye grass should be cut between July 5 and 20 in order to kill the larvæ infesting it before they reach the ground.

(3) The practice of cutting rye grass as advised above may also be extended to brome grass, though it is usually unnecessary because the sawfly larvæ seldom mature in it to a sufficient extent to be a menace to other crops, besides which this grass is an important one for rearing parasites. (See page 7.)

(4) A thinly sown strip or two of wheat on infested land intended for summer-fallow will induce many of the sawflies to lay their eggs on the plants thus provided instead of flying to the nearby fields. The sawflies frequently lay many eggs in one stem though only one grub survives. Summer-fallow used for a trap crop should be ploughed about the middle of July in order to kill the sawfly larvæ.

(5) Sow immune crops such as oats, barley and winter rye. Oats are quite free from attack; barley suffers very little and winter rye is very resistant. Indeed this last is one of the most promising of all our cereal crops because it can be sown on heavily infested land without any of the usual precautions. It is not immune from sawfly attack but it is able to resist the inroads of the insect, so that fully 85 per cent of the larvæ that infest it die. Moreover it can be harvested before it is cut by the larvæ. (See page 7.) Clover, flax and all other broad-leaved plants are immune and can therefore be safely sown.

CO-OPERATION

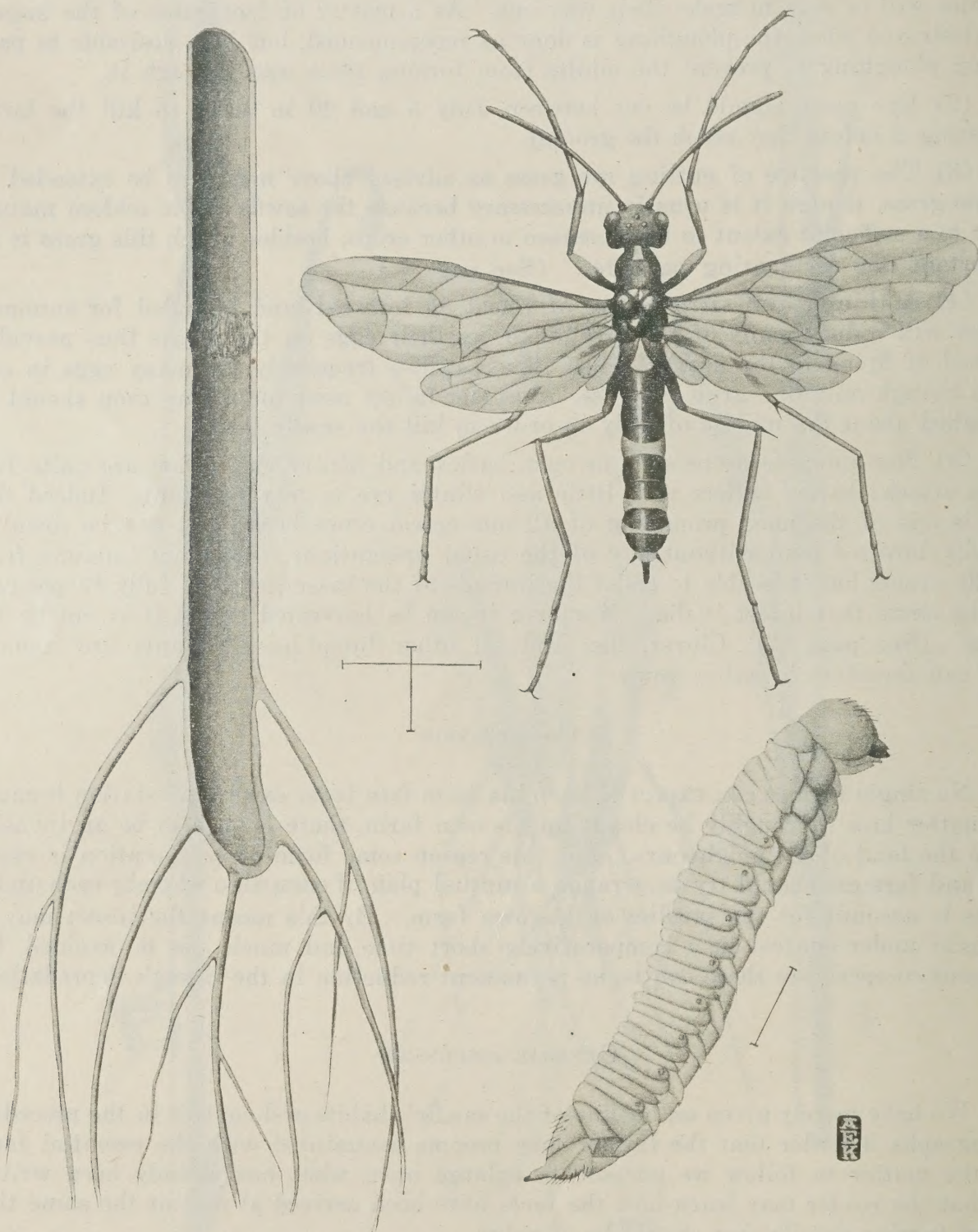
No single farmer can expect to keep his farm free from sawfly infestation because, no matter how thoroughly he cleans up his own farm, there is sure to be an invasion from the land of his neighbours. For this reason some form of co-operation is essential and farmers should try to arrange a mutual plan of campaign whereby each undertakes to account for the sawflies on his own farm. By this means the insect may be brought under control in a comparatively short time and much loss be avoided, but without co-operation there can be no permanent reduction in the insect's depredations.

GENERAL DISCUSSION

We have merely given an outline of the sawfly's habits and control in the preceding paragraphs in order that the farmer may become acquainted with the essential facts. In the matter to follow we purpose to enlarge upon what has already been written so that the reader may learn how the facts have been arrived at and at the same time glean further details that should be of value.

The adult sawflies are not particularly strong fliers and they do not, therefore, fly long distances when there are plants to deposit their egg upon close at hand. As a rule they fly low in order to come into contact with the plants they seek. In a badly infested stubble field there will naturally be millions of these sawflies emerging; should such a field be badly cultivated and sown to wheat or spring rye, the results are apt to be disastrous to the owner. In this case the sawflies find the larval food plants right at their doors and proceed to infest them with eggs without further effort. On the other hand should the infested stubble be intended for summer-fallow and have no available grain growing upon it the insects will then gradually make their

way to the nearest suitable crop, even supposing it is half a mile away. It is owing to this habit of migration and ovipositing upon the first available plants that the edges of grain fields are generally more heavily attacked than the centres. A field that has been infested to the extent of 25 per cent or more the previous year will harbour so many sawflies that they will literally sweep right across the nearby fields, so that



Showing adult sawfly, adult larva, and portion of injured plants, cut open to indicate gnawing of stem by the larva which causes stem to break off at that point — much enlarged. Hair lines indicate natural size of sawfly and maggot. (Author's illustration.)

there is little difference in the comparative severity of attack on any portion of them. In spite of this seeming uniformity of infestation, however, in reality many more eggs are laid in the stems adjacent to last season's breeding grounds, but as only one larva survives in a stem this heavier infestation is generally overlooked.

Winter rye.—This grain gives promise of being of particular value in overcoming the losses caused by the wheat-stem sawfly. It has, besides, the advantage of

being specially adapted to the climatic conditions which prevail in the regions where the insect is most numerous. This rye is by no means immune to the sawfly as it is frequently the receptacle of many eggs but, as a rule, the resulting larvæ find difficulty in obtaining sufficient nourishment in the rather dry stems due to the early ripening of the grain. The result is that a large percentage perish. An additional advantage is that the plants can be harvested before the larvæ that survive in them are able to get below the point where the straw is cut by the binder and they are, therefore, all killed. To ensure the destruction of larvæ by this means it is necessary to cut the crop before July 18 and in order to provide for this it is advisable to prevent cattle grazing upon the rye in spring time.

It seems wise here to emphasize the fact that spring rye is often heavily infested by the sawfly and that it is not, therefore, a desirable grain to sow in infested districts unless it can be sown very early when it escapes with less injury.

Cultivated grasses.—The relation of cultivated grasses to the spread of the sawfly is a problem of much importance and it is possible that we may be obliged to modify our agricultural practices in order to obtain the maximum value in fodder and the minimum numbers of the insect. There are three important grasses being grown by farmers on the prairies at the present time; they are timothy, western rye grass and awnless brome. All of these are severely attacked by the sawfly but only two are of much importance as sawfly carriers, timothy being cultivated chiefly outside the insect's present range. Of the two remaining, both of which are heavily attacked, only rye grass has been found to mature the sawflies in large numbers. Our studies in 1921 showed that about 42 per cent of the insects matured in western rye grass in comparison with only 7 per cent in brome grass. Secondly, that rye grass reared parasites to the extent of 38 per cent as against 54 per cent in brome grass. It will be noted that brome grass appears to be of particular value in controlling the sawfly because it induces large numbers to lay their eggs in it instead of flying to the growing grain, while of the larvæ thus started in their career only a very small percentage survive. Thus the evidence indicates that brome grass is not only a valuable fodder plant but also an important one in assisting to control the western wheat-stem sawfly. For these reasons while we recommend that rye grass be cut by the middle of July to destroy the sawfly larvæ infesting it we think brome grass can be safely left for seed purposes should such be desired.

Parasites.—These are, broadly speaking, small creatures which live at the expense of larger ones. In the case of insects they usually attack their hosts in such a way as to severely weaken or, in many instances, kill them outright by living upon their bodies. Parasites of this kind are among the most useful friends man has, though he cannot always depend upon them to immediately check an insect outbreak. We have found four different kinds of such parasites attacking the wheat-stem sawfly in Manitoba, all belonging to the order Hymenoptera (wasp-like flies). They are *Microbracon cephi* Gahan, *Pleurotropis utahensis* Crawford, *Eupelmus allynii* French, and a species of *Eurytoma*.* All these are present in numbers attacking the sawfly in grasses and it was due to their combined efforts that approximately half the sawfly larvæ were destroyed in said grasses during 1921. Unfortunately these parasites have met with difficulties in following the sawfly from grasses into grain crops, but it is hoped that these difficulties will eventually be overcome.

NOTES

(1) The stems of grain are cut by the sawfly in late July and begin to fall about the last two days of that month, the time being earlier in dry years than in wet ones. Badly infested fields should be harvested as nearly as possible at this date in order

* Determined through the kindness of Mr. W. R. Walton, U.S. Bureau of Entomology, by Mr. A. B. Gahan.

that the straws can be caught by the binder before they fall. By this practice all the grain will be gathered while the grade, at most, will only be reduced one point; whereas if the stems are permitted to fall it will be necessary to use a hayrake after the binder, which results in much shelling of grain, loss of labour and frequently a reduction in grade as well.

(2) The adult sawfly is only active while the sun is shining.

(3) Each female sawfly lays about fifty eggs.

(4) Many eggs may be placed in a single stem but only one larva survives.

(5) Sawflies have been known to fly half a mile in search of suitable plants in which to deposit eggs.

(6) Couch grass (*Aropyron repens*), a common weed, is often heavily infested by sawfly larvæ. It should, therefore, be cut in mid-July or ploughed down.

(7) A wide furrowed plough is better than a narrow one for turning the sawfly infested stubs upside down. Disk ploughs should be avoided for this purpose.

(8) Late sown spring rye is much more severely attacked than when it is sown early.

(9) Duram wheat is often badly injured but not as much as common spring wheat.

(10) Dry years are more favourable for the sawfly's development than are wet seasons and it is on account of this reason that there has been a fluctuation in the yearly increase. In other words, we may expect less injury during favourable crop years than when there is a drouth.

(11) Special attention should be given to the edges of fields in newly infested districts. It is on these edges that the sawfly commences its attack and from them gradually spread inwards. By taking note of these early infestations and ploughing down the stubs much future loss may be avoided and the sawfly be prevented from spreading to other fields.

(12) Disking stubble land is not a satisfactory method of destroying sawfly larvæ.

(13) Burning stubble has little effect upon the insect.

OTTAWA, April, 1922.